DECLARATION

I, Young Woo Park, Korean Patent Attorney of 5F, Seil Building, 727-13, Yoksam-dong, Gangnam-gu, Seoul, Korea do hereby solemnly and sincerely declare as follows:

1. That I am well acquainted with the English and Korean languages.
2. That the following is a correct translation into English of the accompanying certified copy of a Korean Patent Application No. 2003-41330.

and I make the solemn declaration conscientiously believing the same to be true.

Seoul, January 13, 2006

Young Woo Park

Young-Woo PARK

THE KOREAN INDUSTRIAL PROPERTY OFFICE

This is to certify that annexed hereto is a true copy from the records of the Korean Industrial Property Office of the following application as filed.

Application Number : Patent Application No. 2001-41330

Date of Application : June 25, 2003

Applicant : Samsung Electronics Co., Ltd.

COMMISSIONER

PATENT APPLICATION

Applicant : Name: Samsung Electronics Co., Ltd.
(Representative: Jong-Yong YUN)

Address : 416 Maetan-dong, Yoengtong-gu, Suwon-city,
Kyungki-do, Republic of Korea

Agent(s) : Young-Woo PARK

Inventor(s) : Name : Sang-Duk LEE

: Address : 626-1001 Jinheung Apt., #1027,
Pungdeokcheon-ri, Suji-eup,
Yongin-si, Gyeonggi-do, Republic of Korea

Inventor(s) : Name : Jung-Tae Kang

: Address :717-1103 Salgugol 7danji Apt. Yeongtong-dong,
Paldal-gu, Suwon-si, Gyeonggi-do,
Republic of Korea

Title of the Invention : LIQUID CRYSTAL DISPLAY AND TABLET PC HAVING THE SAME

Dated this: June 25, 2003

To the COMMISSIONER

[ABSTRACT]

A liquid crystal display apparatus for improving productivity and a tablet PC having the same are disclosed. The liquid crystal display panel receives an image data, and displays an image according to the image data. A driver printed circuit board provides a liquid crystal display panel with the image data. A backlight assembly is disposed under the liquid crystal display panel, and provides the liquid crystal display panel with light. A receiving container provides a first receiving space to receive the liquid crystal display panel and the backlight assembly, and provides a second receiving space that is positioned higher than the driver printed circuit board disposed at the rear of the receiving container. A digitizer outputting an image data according to a coordinate signal into the driver printed circuit board is inserted into the second receiving space. Therefore, a process of inserting a digitizer may be simple and productivity may be improved.

[REPRESENTATIVE FIGURE]

FIG. 6

[SPECIFICATION]

[TITLE OF THE INVENTION]

LIQUID CRYSTAL DISPLAY AND TABLET PC HAVING THE SAME

[BRIEF EXPLANATION OF THE DRAWINGS]

FIG. 1 is a perspective view showing a construction of a tablet PC.

FIG. 2 is a perspective view showing a tablet PC installed in a docking station.

FIG. 3 is a cross-sectional view showing a LCD module used in a usual tablet PC.

FIG. 4 is an exploded perspective view showing a liquid crystal display apparatus according to a first exemplary embodiment of the present invention

FIG. 5 is a plan view showing a backside of a backlight assembly of FIG. 4

FIG. 6 is a cross-sectional view taken along the line A-A' of FIG. 5.

FIG. 7 is a cross-sectional view taken along a line B-B' of FIG. 5.

FIG. 8 is a perspective view showing an insertion of a digitizer into a mold frame and a data printed circuit board.

FIG. 9 is a plain view showing a backside of a backlight assembly of a liquid crystal display apparatus according to a second exemplary embodiment of the present invention.

FIG. 10 is a cross-sectional view taken along the line C-C' of FIG. 9.

FIG. 11 is a plan view showing another digitizer being inserted into the insertion space.

<EXPLANATION ON CHIEF REFERENCE NUMERALS OF DRAWINGS >

400 : liquid crystal display apparatus	500 : display assembly
510 : liquid crystal display panel	530 : data printed circuit board
532 : first connection portion	534 : second connection portion
580 : protection glass	700 : mold frame
710 : third connection portion	720 : fourth connection portion
730 : first protrusion	740 : second protrusion
750 : insertion space	900 : digitizer

[DETAILED DESCRIPTION OF THE INVENTION]

[PURPOSE OF THE INVENTION]

[THE ART TO WHICH THE INVENTION PERTAINS AND THE PRIOR ART]

The present invention relates to a liquid crystal display apparatus and a tablet PC having the liquid crystal display apparatus, and more particularly to liquid crystal display apparatus and a tablet PC having the liquid crystal display apparatus to improve productivity.

Generally, a tablet is a device for a two-dimensional graphic work. A pointing device indicates a coordinate to write characters or draw a picture, and the tablet perceives the coordinate.

A personal computer having a function of the above-mentioned tablet is a tablet PC.

As shown in FIG. 1, the tablet PC 100 includes a pointing device 110 via which a two-dimensional coordinate is inputted, a liquid crystal display panel 120 displaying an image and a PC body 130 that includes a digitizer (not

shown) transforming the two-dimensional coordinate into an electrical signal. A protection glass (not shown) is disposed on the liquid crystal display panel 120 to prevent the liquid crystal display panel 120 from being damaged by the pointing device 110.

Also, as shown in FIG. 2, a tablet PC 100 may be combined with a docking stage 200, so that the tablet PC 100 is used as a desktop PC. A wireless or wired keyboard 210 may be connected to the tablet PC 100, so that the tablet PC may receive signals from the keyboard 210 or a pointing device 110.

FIG. 3 is a cross-sectional view showing a general LCD module used for a tablet PC.

As shown in FIG. 3, a usual liquid crystal display module used in a tablet PC includes a liquid crystal display panel 300, a data printed circuit board (PCB) 310 providing the liquid crystal display panel 300 with an image signal, a backlight assembly 320 providing the liquid crystal display panel 300 with light, a digitizer 330 transforming coordinate information inputted from the pointing device 110 into an electrical signal and a protection glass 340 preventing the liquid crystal display panel from being damaged by the pointing device 110.

The data printed circuit board 310 is electrically connected to the liquid crystal display panel 300 via a tape carrier package (TCP) 360 having a data driver chip attached thereon. The TCP 360 is bent, so that the data printed circuit board 310 is disposed on a backside of the backlight assembly 320.

The digitizer 330 is interposed between the data printed circuit board 310 and the backlight assembly 320. The data printed circuit board 310 is

lifted up, and the digitizer 330 is inserted into the rear of the backlight assembly 320.

Thus, during the data printed circuit board 310 is being lifted up, a channel terminal of the data driver chip formed on the TCP may be damaged or opened.

Further, a worker should pay attention to details of a process for assembling the general LCD module, so that a time spent for manufacturing the tablet PC increases. There, productivity is decreased.

[TECHNICAL OBJECT OF THE INVENTION]

Accordingly, the present invention is provided to substantially obviate one or more problems due to limitations and disadvantages of the related art.

The present invention provides a liquid crystal display apparatus for enhancing productivity.

Also, The present invention provides a tablet PC having the liquid crystal display apparatus.

[CONTRUCTION AND FUNCTION OF THE INVENTION]

A liquid crystal display apparatus according to a first feature of the present invention to achieve the above mentioned objects includes a liquid crystal display panel, a driver printed circuit board, a backlight assembly and a receiving container. The liquid crystal display panel receives an image data, and displays an image according to the image data. The driver printed circuit provides the liquid crystal display panel with the image date. The backlight assembly is disposed under the liquid crystal display panel so as to provide the liquid crystal display panel with light. The receiving container includes first and

second connection portions that are extended from both end portions of the receiving container, first and second protrusion portions that protrude by a predetermined height from back sides of the first and second connection portions respectively, and first and second connection grooves that are recessed by a predetermined depth from upper sides of the first and second protrusion portions respectively. The receiving container is formed under the backlight assembly so as to have a receiving space that is spaced apart by a predetermined distance from the driver printed circuit board.

A liquid crystal display apparatus according to a second feature of the present invention includes a liquid crystal display panel, a driver printed circuit board, a backlight assembly and a receiving container. The liquid crystal display panel receives an image data, and displays an image according to the image data. The driver printed circuit provides the liquid crystal display panel with the image date. The backlight assembly is disposed under the liquid crystal display panel so as to provide the liquid crystal display panel with light. The receiving container includes first and second connection portions that protrude by a predetermined height from both end portions of the receiving container respectively, first and second connection grooves that are recessed by a predetermined depth from upper sides of the first and second protrusion portions respectively. The receiving container is formed under the backlight assembly so as to have a receiving space that is spaced apart by a predetermined distance from the driver printed circuit board.

A tablet personal computer according to a third feature of the present invention includes a liquid crystal display panel displaying an image, a driver

printed circuit board providing the liquid crystal display panel with an image data, a backlight assembly disposed under the liquid crystal display panel to provide the liquid crystal display panel with light, a receiving container including a first receiving space to receive the liquid crystal display panel and the backlight assembly, and a second receiving space that are spaced apart by a predetermined distance from the driver printed circuit board, a chassis facing the receiving container to fix the liquid crystal display panel and the backlight assembly and a digitizer that provides the driver printed circuit board with signals corresponding to coordinate information, the digitizer being disposed between the driver printed circuit board and the receiving container.

According to the liquid crystal display apparatus and the tablet personal computer, a work inserts the digitizer into an insertion space formed between the data printed circuit board and mold frame, such that a process of inserting a digitizer may be simple and productivity may be improved.

Hereinafter, a LCD module of a tablet PC according to a preferred example embodiment of the present invention will be described in detail with reference to the accompanied drawings.

<First example embodiment>

FIG. 4 is an exploded perspective view showing a liquid crystal display apparatus according to a first exemplary embodiment of the present invention, and FIG. 5 is a plan view showing a backside of a backlight assembly of FIG. 4. FIG. 6 is a cross-sectional view taken along the line A-A' of FIG. 5, and FIG. 7 is a cross-sectional view taken along a line B-B' of FIG. 5.

Referring to FIG. 4, a liquid crystal display apparatus 400 according to a

first exemplary embodiment of the present invention includes a display assembly 500 displaying an image and a backlight assembly 600 providing the display assembly 500 with light.

The display assembly 500 includes a liquid crystal display panel 510 displaying an image, a gate printed circuit board 520 providing the liquid crystal display panel 510 with driving signals, a data printed circuit board 530 providing the liquid crystal display panel 510 with image data signals, a gate tape carrier package 540 disposed between the liquid crystal display panel 510 and the gate printed circuit board 520, and a data tape carrier package 550 disposed between the liquid crystal display panel 510 and the data printed circuit board 530.

The liquid crystal display panel 510 includes a TFT substrate 512 on which a thin film transistor (not shown) and a pixel electrode (not shown) are formed, a color filter substrate 514, on which a color filter (not shown) and a common electrode (not shown) are formed, facing the TFT substrate 512, and a liquid crystal layer (not shown) interposed between the TFT substrate 512 and the color filter substrate 514.

Herein, a plurality of data lines (not shown) extended in a row direction and a plurality of gate lines (not shown) extended in a column direction are formed on the TFT substrate 512. In addition, the TFT is formed on the TFT substrate 512 in a matrix shape. A source electrode of the TFT is electrically connected to one of the data lines, and a gate electrode of the TFT is electrically connected to one of the gate lines. A drain electrode of the TFT is electrically connected to the one of the pixel electrodes.

The gate lines are electrically connected to the gate tape carrier package 540 having a gate driver chip 560, and the data lines are electrically connected to the data tape carrier package 550 having a data driver chip 570.

The data tape carrier package 550 is electrically connected to the data printed circuit board 530, so that the data printed circuit board 550 applies an image data signal to the data lines via the data tape carrier package 550 at the right time. The gate tape carrier package 540 is electrically connected to the gate printed circuit board 520, so that the gate printed circuit board 520 applies a gate driving signal to the gate lines via the gate tape carrier package 540.

A protection glass 580 is formed on the liquid crystal display panel 510 to prevent the liquid crystal display panel 510 from being damaged by an input pen (not shown).

The backlight assembly 600 includes light generating section 610 generating light and light guide plate 620 guiding the light generated from the light generating section 610 toward the liquid crystal display panel 510. The light generating section 610 includes a lamp 612 and a lamp reflector 614 covering the lamp 612 to reflect light generated from the lamp 612 toward the light guide plate 620.

The back light assembly 600 further includes a reflection plate 630 disposed under the light guide plate 620 to reflect light that is leaked from the light guide plate 620 toward the light guide plate 620, and optical sheets 640 disposed over the light guide plate 630 to uniformize a luminance of light emitted from the light guide plate 620.

A mold frame 700 receives the display assembly 500 and the backlight

assembly 600. The mold frame 700 receives the reflection plate 630, the light guide plate 620 and the optical sheets 640 in sequence. Then, the mold frame 700 receives the liquid crystal display panel 510, such that the liquid crystal display panel 510 is disposed over the optical sheets 640. A chassis 800 is facing the mold frame 700. The chassis 800 is combined with the mold frame 700 to fix the display assembly 500 and the backlight assembly 600 at the mold frame 700.

A digitizer 900 is disposed under the mold frame 700. The digitizer 900 transforms coordinate information from the input pen into an electrical signal, and then, the electrical signal is transferred to a tablet PC body (not shown). The tablet PC body outputs an image data according to the electrical signal inputted from the digitizer 900 into the data printed circuit board 530, and the data printed circuit board 530 outputs the image data inputted from the tablet PC into the data lines

The data tape carrier package 550 is bent, such that the data printed circuit board 530 of the display assembly 500 is disposed at a backside of the mold frame 700 as show in FIG. 5.

Herein, the data printed circuit board 530 includes first and second connection portions 532 and 534 that are extended from each end of the data printed circuit board 530 and fixed at the mold frame 700 through a first bolt 650 and a second bolt 660. Also, a first connection hole 536 and a second connection hole 538 through which the first and second bolts 650 and 660 penetrate are formed at the first and second connection portions 532 and 534.

The mold frame 700 includes third and fourth connection portions 710

and 720 formed at a position corresponding to the first and second connection portions 532 and 534 respectively, to be combined with the data printed circuit board 530 that is disposed at a backside of the mold frame 700.

As shown in FIGS. 6 and 7, the mold frame 700 includes a third connection portion 710 that is extended from a first end portion of the mold frame 700 and formed at a position corresponding to the first connection portions 532, and a fourth connection portion 720 that is extended from a second end portion of the mold frame 700 and formed at a position corresponding to the second connection portions 534. Herein, the third connection portion 710 includes a first protrusion 730 that protrudes upwardly from the third connection portion 710, and the fourth connection portion 720 includes a second protrusion 740 that protrudes from the fourth connection portion 720 as substantially same as the second protrusion 740 in height.

The first protrusion 730 includes a first connection groove 732 that formed at a position corresponding to the first connection hole 536 of the data printed circuit board 530. The second protrusion 740 includes a second connection groove 742 that formed at a position corresponding to the second connection hole 538.

The data printed circuit board 530 and the mold frame 700 are combined together by Front Mount method.

That is, the first and second bolts 650 and 660, which is positioned perpendicularly to the first and second connection portions 532 and 534, pass through the first and second connection holes 536 and 538, and then are inserted into the first and second connection grooves 732 and 734 of the mold

frame 700, so that the data printed circuit board 530 is fixed at a backside of the mold frame 700.

Then, an insertion space 750 having a predetermined height is formed between the data printed circuit board 530 and the mold frame 700 that are fixed through the first and second bolts 650 and 660. That is, an insertion space 750 having a height corresponding to protrusion heights of the first and second protrusions 730 and 740, which are formed at the third and fourth connection portions 710 and 720 respectively, is formed between the data printed circuit board 530 and the mold frame 700. Then, the digitizer 900 is inserted into the insertion space 750.

FIG. 8 is a perspective view showing an insertion of a digitizer into a mold frame and a data printed circuit board.

As shown in FIG. 8, a digitizer 900 is inserted into an insertion space in a direction that an arrow indicates, so that a digitizer 900 is disposed between the data printed circuit board 530 and the mold frame 700. Thus, a worker does not need to lift up the data printed circuit board 530 to insert the digitizer 900, when assembling an LCD module. As a result, channel terminals of a data driver chip 570 formed on the data tape carrier package 550 are not opened.

The digitizer 900, which is to be inserted into the insertion space 750, has the same width as the liquid crystal display apparatus 400. The width of the liquid crystal display apparatus 400 is determined by the chassis 800, herein, widths of the chassis 800 in an insertion direction D1 and a perpendicular direction D2 are the same as those of the digitizer 900.

Thus, in order to form a space into which the digitizer 900 is inserted, both ends of the data printed circuit board 530 extend so as to form the first and second connection portions 532 and 534, and both ends of the mold frame 700 extend so as to form the third and fourth connection portions 710 and 720. Also, the first and second connection portions 532 and 534 of the data printed circuit board 530 are combined with the third and fourth connection portions 710 and 720 of the mold frame 700 respectively, so that the insertion space 750 into which the digitizer 900 having the above-mentioned width may be inserted is formed.

<Second example embodiment>

FIG. 9 is a plain view showing a backside of a backlight assembly of a liquid crystal display apparatus according to a second exemplary embodiment of the present invention, and FIG. 10 is a cross-sectional view taken along the line C-C' of FIG. 9.

An LCD module having a backlight assembly according to the second exemplary embodiment of the present invention has the same structure as the first example embodiment. Therefore, detailed explanations will be omitted.

As shown in FIG. 9, a backlight assembly according to a second exemplary embodiment of the present invention includes a data printed circuit board 1100 disposed under a backside of a mold frame 1000. A data tape carrier package 550 is bent, so that the data printed circuit board 1100 is disposed under the mold frame 1000. A width of the data printed circuit board 1100 is shorter than that of the mold frame 1000, and a width of the digitizer 1200 inserted between the data printed circuit board 1100 and the mold frame

1000 is shorter than that of the mold frame 1000.

The data printed circuit board 1100 includes first and second connection portions 1110 and 1120 that are extended from each end of the data printed circuit board 1100 and fixed at the mold frame 1000 through a first bolt 1300 and a second bolt 1400. Also, a first connection hole 1130 and a second connection hole 1140 through which the first and second bolts 1300 and 1400 penetrate are formed at the first and second connection portions 1110 and 1120.

The mold frame 1000 is combined with the data printed circuit board 1100 disposed at a backside of the mold frame 1000. As shown in FIG. 10, the mold frame 1000 includes a first protrusion 1010 and a second protrusion 1020 that protrude from a backside of the mold frame 1000 by a predetermined height corresponding to the first and second connection portions 1110 and 1120 of the data printed circuit board 1100. Herein, the first and second protrusions 1010 and 1020 include first and second connection grooves 1030 and 1040 that are recessed by a predetermined depth corresponding to the first and second connection holes 1130 and 1140 of the first and second connection portions 1110 and 1120.

The data printed circuit board 1100 and the mold frame 1000 may be combined together by Front Mount method.

That is, the first and second bolts 1300 and 1400, which is positioned perpendicularly to the first and second connection portions 1110 and 1120, pass through the first and second connection holes 1130 and 1140, and then are inserted into the first and second connection grooves 1030 and 1040 of the mold frame 1000, so that the data printed circuit board 1100 is fixed at the mold

frame 1000.

Then, an insertion space 1050 having a predetermined height is formed between the data printed circuit board 1100 and the mold frame 1000 that are fixed through the first and second bolts 1300 and 1400. That is, an insertion space 1050 having a height corresponding to protrusion heights of the first and second protrusions 1010 and 1020 that are formed at the mold frame 1000.

A horizontal width of the insertion space 1050 is shorter than that of the mold frame 1000. That is, when widths W1 of the first and second connection portions 1110 and 1120 are subtracted from the width of the insertion space 1050, the width of the insertion space 1050 is obtained.

FIG. 11 is a plan view showing another digitizer being inserted into the insertion space.

As shown in FIG. 11, a portion of a first edge 1502 and a portion of a second edge 1504 corresponding to the first and second protrusions 1010 and 1020 of the mold frame 1000 are chamfered. In detail, the corners of the first and second edges 1502 and 1504 are cut out as much as a depth W1 of the first and second protrusions 1010 and 1020, such that the digitizer 1500 may be inserted into the insertion space 1050 even though the horizontal width of the digitizer 1500 is wider than that of the insertion space 1050.

Hereinbefore, a liquid crystal display apparatus having the data driver chip 570 formed on the data tape carrier package 550 is explained.

When a liquid crystal display apparatus employs a chip on glass (COG) type liquid crystal display panel and uses flexible printed circuit (FPC) as a data printed circuit board, output terminals of a data driver chip may not be opened

even though a worker lifts up a data printed circuit board to dispose a digitizer between a mold frame and the data printed circuit board.

Further, the structure of the liquid crystal display apparatus according to the present invention is applied to a touch screen type tablet PC having a tablet panel that receives position coordinates from an input pen and transfers the position coordinates to a digitizer.

[EFFECT OF THE INVENTION]

As described above, an insertion space for receiving the digitizer is formed between the data printed circuit board that is disposed under the mold frame and mold frame. That is, the first and second connection portions protruding at each end of the mold frame and having the first and second protrusions respectively, so that the insertion space is formed.

The digitizer is inserted into the insertion space, such that a work for lifting up the data printed circuit board to insert the digitizer into between the data printed circuit board and mold frame is not required.

Therefore, terminals of the data driver chip formed on the TCP are not opened, which frequently occurs when the data printed circuit board is lifted up. Further, productivity is enhanced because of simplicity of work.

Having described the example embodiments of the present invention and its advantages, it is noted that various changes, substitutions and alterations can be made herein without departing from the spirit and scope of the invention as defined by appended claims.

[CLAIMS]

[CLAIM 1]

A liquid crystal display apparatus comprising:

a liquid crystal display panel that receives an image data and displays an image according to the image data;

a driver printed circuit board that is electrically connected to the liquid crystal display panel to provide the liquid crystal display panel with the image date;

a backlight assembly disposed under the liquid crystal display panel to provide the liquid crystal display panel with light; and

a receiving container including a first receiving space to receive the liquid crystal display panel and the backlight assembly, and a second receiving space that are spaced apart by a predetermined distance from the driver printed circuit board.

[CLAIM 2]

The liquid crystal display apparatus of claim 1, wherein the receiving container includes:

a first connection portion and a second connection portion that are extended from both end portions of the receiving container;

a first protrusion portion and a second protrusion portion that protrude by a predetermined height from back sides of the first and second connection portions respectively; and

a first connection groove and a second connection groove that are recessed by a predetermined depth from upper sides of the first and second

protrusion portions respectively.

[CLAIM 3]

The liquid crystal display apparatus of claim 2, wherein the driver printed circuit board includes third and fourth connection portions corresponding to the first and second connection portions, the third and fourth connection portions having first and second connection holes corresponding to the first and second connection grooves respectively.

[CLAIM 4]

The liquid crystal apparatus of claim 3, wherein the driver printed circuit board is fixed to the receiving container by first and second bolts, the first and second bolts passing through the first and second connection holes and being connected to the first and second connection grooves.

[CLAIM 5]

The liquid crystal display apparatus of claim 1, wherein the receiving container includes:

a first protrusion portion and a second protrusion portion portions that protrude by a predetermined height from both end portions of the receiving container respectively; and

a first connection groove and a second connection groove that are recessed by a predetermined depth from upper sides of the first and second protrusion portions respectively.

[CLAIM 6]

The liquid crystal display apparatus of claim 5, wherein the driver printed circuit board includes first and second connection portions

corresponding to the first and second protrusion portions, the first and second connection portions having first and second connection holes corresponding to the first and second connection grooves respectively.

[CLAIM 7]

The liquid crystal apparatus of claim 6, wherein the driver printed circuit board is fixed to the receiving container by first and second bolts, the first and second bolts passing through the first and second connection holes and being connected to the first and second connection grooves.

[CLAIM 8]

The liquid crystal display apparatus of claim 1, wherein a digitizer is inserted into the second receiving space, the digitizer outputting an image signal according to coordinate information into the driver printed circuit board.

[CLAIM 9]

A liquid crystal display apparatus comprising:

a liquid crystal display panel that receives an image data and displays an image according to the image data;

a driver printed circuit board that is electrically connected to the liquid crystal display panel to provide the liquid crystal display panel with the image date;

a backlight assembly disposed under the liquid crystal display panel to provide the liquid crystal display panel with light; and

a receiving container including first and second connection portions that are extended from both end portions of the receiving container, first and second protrusion portions that protrude by a predetermined height from back sides of

the first and second connection portions respectively, first and second connection grooves that are recessed by a predetermined depth from upper sides of the first and second protrusion portions respectively, and a receiving container formed under the backlight assembly so as to have a receiving space that is spaced apart by a predetermined distance from the driver printed circuit board,

wherein a digitizer is inserted into the receiving space, the digitizer outputting an image signal according to coordinate information into the driver printed circuit board.

[CLAIM 10]

A liquid crystal display apparatus comprising:

a liquid crystal display panel that receives an image data and displays an image according to the image data;

a driver printed circuit board that is electrically connected to the liquid crystal display panel to provide the liquid crystal display panel with the image date;

a backlight assembly disposed under the liquid crystal display panel to provide the liquid crystal display panel with light; and

a receiving container including first and second connection portions that protrude by a predetermined height from both end portions of the receiving container respectively, first and second connection grooves that are recessed by a predetermined depth from upper sides of the first and second protrusion portions respectively, and a receiving container formed under the backlight assembly so as to have a receiving space that is spaced apart by a

predetermined distance from the driver printed circuit board,

wherein a digitizer is inserted into the receiving space, the digitizer outputting an image signal according to coordinate information into the driver printed circuit board.

[CLAIM 11]

A tablet personal computer comprising:

a liquid crystal display panel displaying an image;

a driver printed circuit board providing the liquid crystal display panel with an image signal for displaying the image;

a backlight assembly disposed under the liquid crystal display panel to provide the liquid crystal display panel with light;

a receiving container including a first receiving space to receive the liquid crystal display panel and the backlight assembly, and a second receiving space that are spaced apart by a predetermined distance from the driver printed circuit board;

a chassis facing the receiving container to fix the liquid crystal display panel and the backlight assembly; and

a digitizer that provides the driver printed circuit board with signals corresponding to coordinate information, the digitizer being disposed between the driver printed circuit board and the receiving container.

[CLAIM 12]

The tablet personal computer of claim 11, wherein the receiving container includes:

a first connection portion and a second connection portion that are

extended from both end portions of the receiving container;

a first protrusion portion and a second protrusion portion that protrude by a predetermined height from back sides of the first and second connection portions respectively; and

a first connection groove and a second connection groove that are recessed by a predetermined depth from upper sides of the first and second protrusion portions respectively.

[CLAIM 13]

The tablet personal computer of claim 2, wherein the driver printed circuit board includes third and fourth connection portions corresponding to the first and second connection portions, the third and fourth connection portions having first and second connection holes corresponding to the first and second connection grooves respectively.

[CLAIM 14]

The tablet personal computer of claim 13, wherein the driver printed circuit board is fixed to the receiving container by first and second bolts, such that the second receiving space is formed, the first and second bolts passing through the first and second connection holes and being connected to the first and second connection grooves.

[CLAIM 15]

The tablet personal computer of claim 14, wherein a width of the digitizer in a direction perpendicular to a direction in which the digitizer is inserted into the second receiving space is the same as that of the chassis.

[CLAIM 16]

The tablet personal computer of claim 11, wherein the receiving container includes:

a first protrusion portion and a second protrusion portion portions that protrude by a predetermined height from both end portions of the receiving container respectively; and

a first connection groove and a second connection groove that are recessed by a predetermined depth from upper sides of the first and second protrusion portions respectively.

[CLAIM 17]

The tablet personal computer of claim 16, wherein the driver printed circuit board includes first and second connection portions corresponding to the first and second protrusion portions, the first and second connection portions having first and second connection holes corresponding to the first and second connection grooves respectively.

[CLAIM 18]

The tablet personal computer of claim 17, wherein the driver printed circuit board is fixed to the receiving container by first and second bolts, such that the second receiving space is formed, the first and second bolts passing through the first and second connection holes and being connected to the first and second connection grooves.

[CLAIM 19]

The tablet personal computer of claim 18, wherein a width of the digitizer

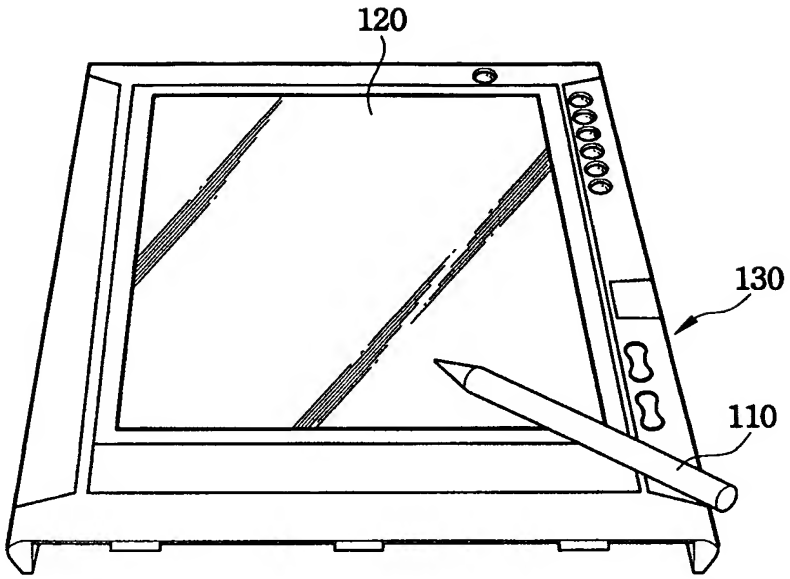
in a direction perpendicular to a direction in which the digitizer is inserted into the second receiving space is shorter than that of the chassis.

[CLAIM 20]

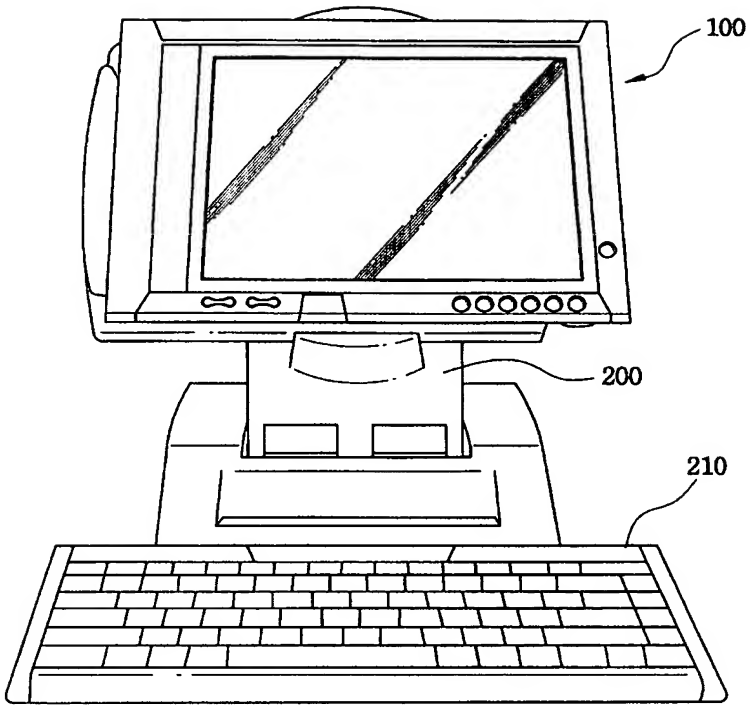
The tablet personal computer of claim 18, wherein the digitizer is chamfered to be disposed between the driver printed circuit board and the receiving container.

[DRAWING]

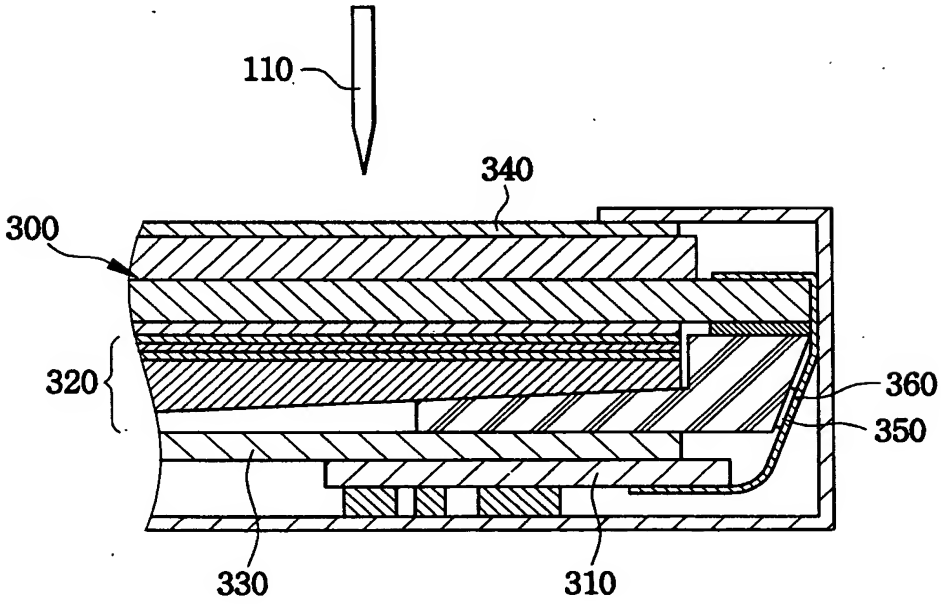
[FIG. 1]



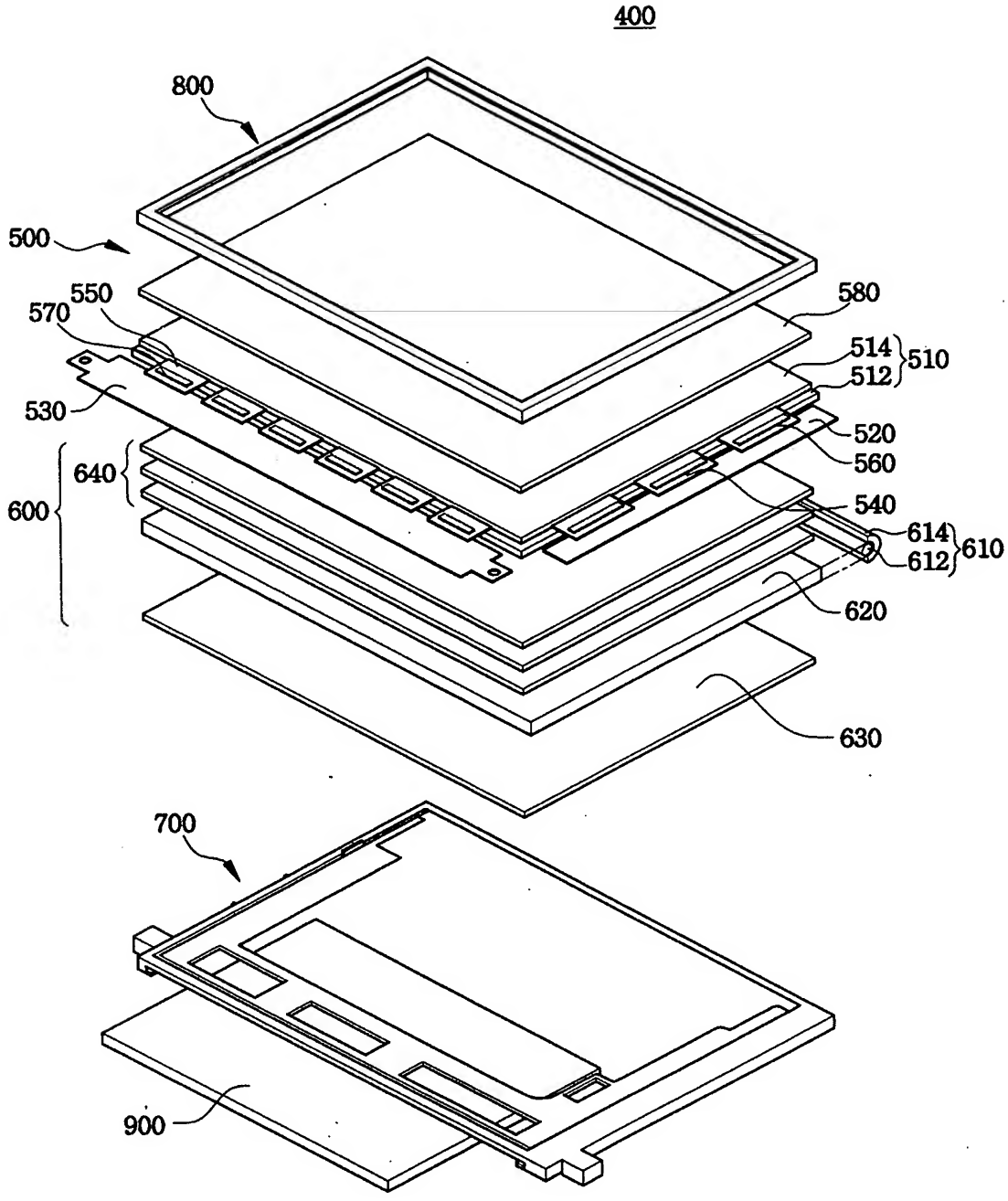
[FIG. 2]



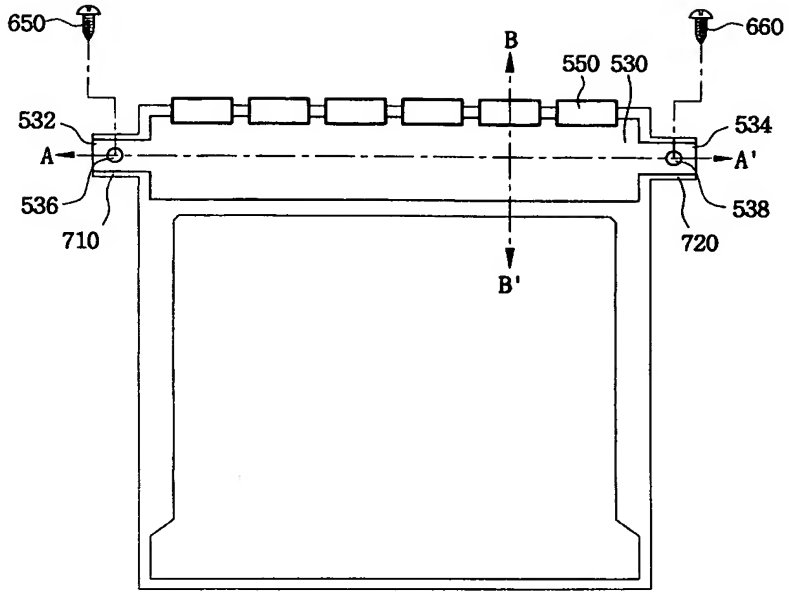
[FIG. 3]



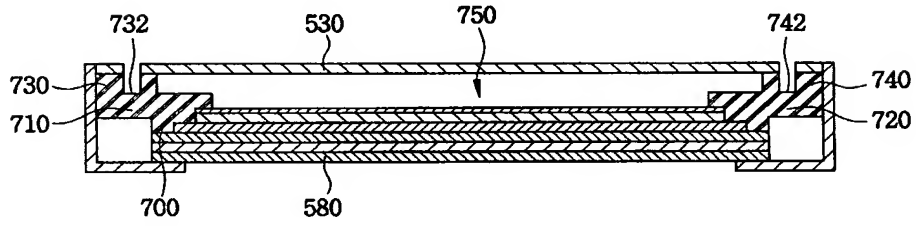
[FIG. 4]


400
800
500
550
570
580
514
512
510
530
520
560
640
600
540
614
612
610
620
630
700
900

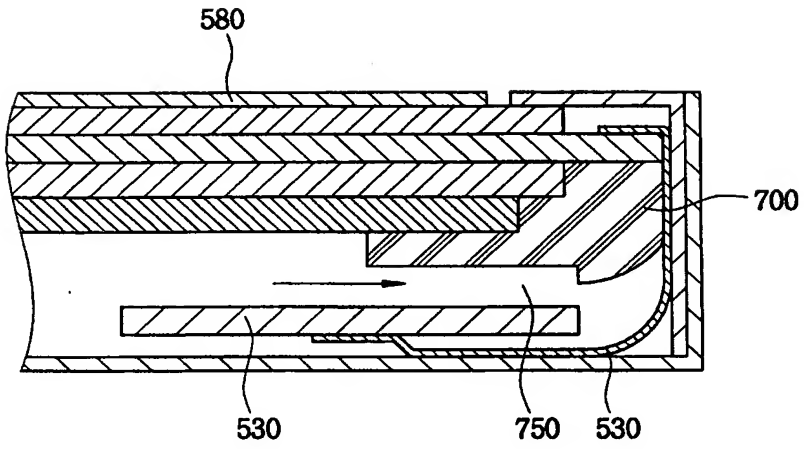
[FIG. 5]


650
660
B
550
530
532
534
A
A'
536
538
710
720
B'

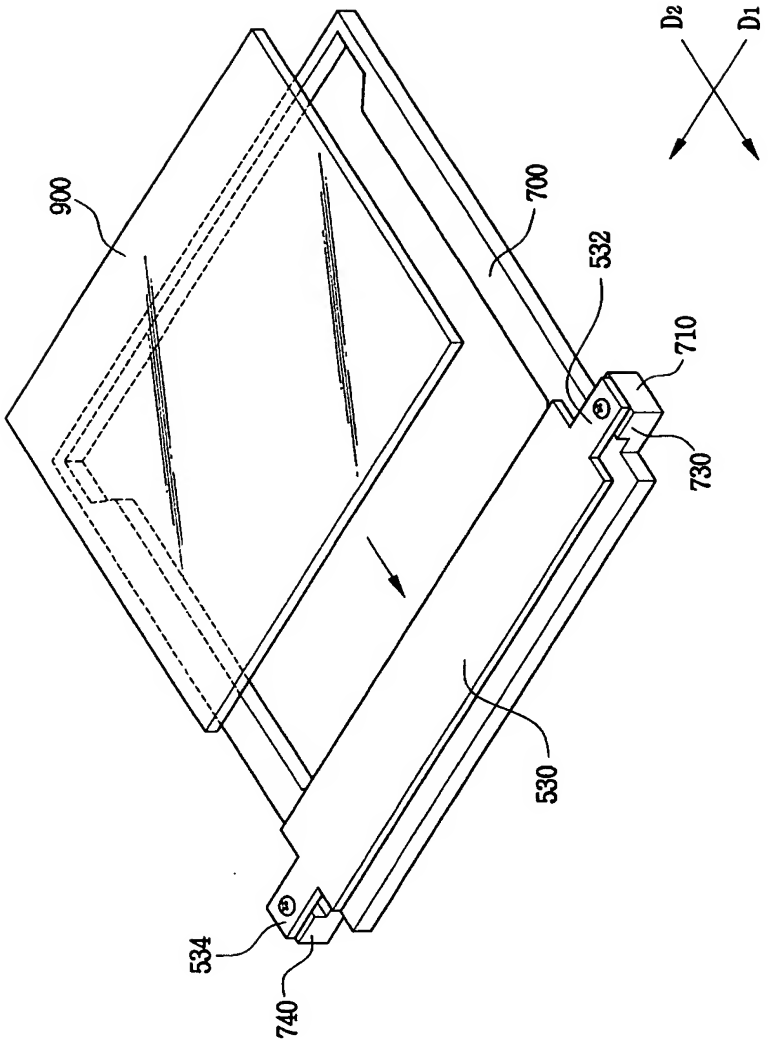
[FIG. 6]


732
530
750
742
730
740
710
720
700
580

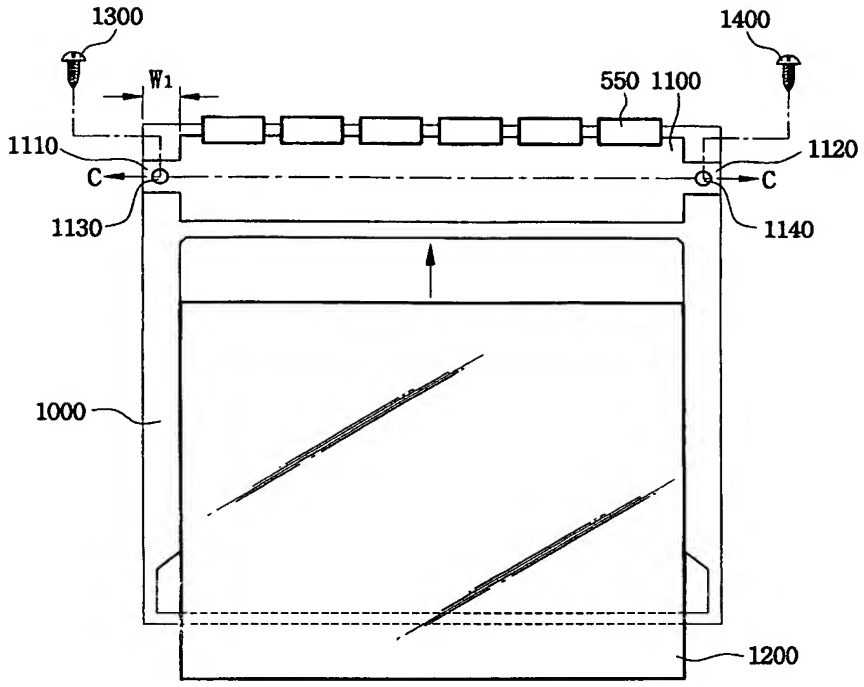
[FIG. 7]



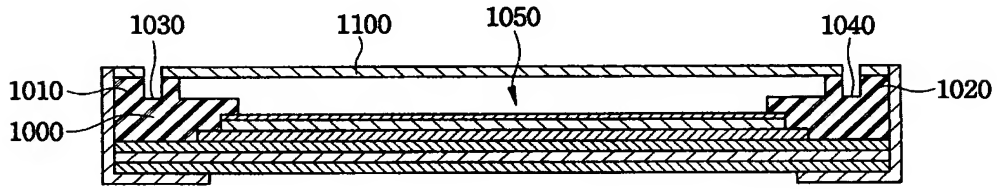
[FIG. 8]



[FIG. 9]


1300
1400
W1
550
1100
1110
1120
C
C
1130
1140
1000
1200

[FIG. 10]


1030
1100
1050
1040
1010
1020
1000

[FIG. 11]